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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/796,427

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Mou-Shiung Lin

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7590 08/24/2007  
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EXAMINER

LEWIS, MONICA

ART UNIT

PAPER NUMBER

2822

MAIL DATE

DELIVERY MODE

08/24/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/796,427

Applicant(s)

LIN ET AL.

Examiner

Monica Lewis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 May 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 69-90 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 69-90 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                                            |                                                                                         |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                           | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____                                                |

### DETAILED ACTION

1. This office action is in response to the request for continued examination filed May 16, 2007.

#### *Continued Examination Under 37 CFR 1.114*

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/16/07 has been entered.

#### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 69-74 and 80-85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akram (U.S. Patent No. 6,544,880) in view of Yanagida (U.S. Patent No. 6,545,355).

In regards to claim 69, Akram discloses the following:

- a) a semiconductor substrate (11) (For Example: See Figure 1);
- b) multiple transistors in or on said semiconductor substrate (For Example: See Figure 1);
- c) an interconnecting metallization structure (12') over said semiconductor substrate (For Example: See Figure 2F);

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d) a passivation layer (13) over said interconnecting metallization structure, wherein an opening in said passivation layer exposes a contact point of said interconnecting metallization structure (For Example: See Figure 2F);

e) a first metal layer (12'') over said contact point (For Example: See Figure 2F and Column 5 Lines 45-50); and

f) a second metal layer (12'') over said first metal layer, wherein said second metal layer is used to be wire bonded (For Example: See Figure 2F).

In regards to claim 69, Akram fails to disclose the following:

a) a first metal layer comprises aluminum.

However, Yanagida discloses a first metal layer (20a) that comprises aluminum (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Akram to include aluminum as disclosed in Yanagida because it aids in increasing adhesion (For Example: See Column 3 Lines 17-19).

Additionally, since Akram and Yanagida are both from the same field of endeavor, the purpose disclosed by Yanagida would have been recognized in the pertinent art of Akram.

In regards to claims 70 and 81, Akram discloses the following:

a) passivation layer comprises a topmost nitride layer of said semiconductor chip or wafer (For Example: See Column 5 Lines 35 and 36).

In regards to claims 71 and 82, Akram discloses the following:

a) passivation layer comprises a topmost oxide layer of said semiconductor chip or wafer (For Example: See Column 5 Lines 35 and 36).

In regards to claims 72 and 83, Akram discloses the following:

a) interconnecting metallization structure comprises copper (For Example: See Column 5 Line 6).

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In regards to claims 73 and 84, Akram discloses the following:

- a) second metal layer comprises gold (For Example: See Column 5 Line 19).

In regards to claims 74 and 85, Akram discloses the following:

- a) second metal layer comprises copper (For Example: See Column 4 Lines 29-32).

In regards to claim 80, Akram discloses the following:

- a) a semiconductor substrate (For Example: See Figure 1);
  - b) multiple transistors in or on said semiconductor substrate (For Example: See Figure 1);
  - c) an interconnecting metallization structure over said semiconductor substrate (For Example: See Figure 2F);
  - d) a passivation layer over said interconnecting metallization structure, wherein an opening in said passivation layer exposes a contact point of said interconnecting metallization structure (For Example: See Figure 2F);
  - e) a first metal layer over said contact point (For Example: See Figure 2F and Column 5 Lines 45-50);
  - f) a second metal layer over said first metal layer (For Example: See Figure 2F);
- and
- g) a wire wirebonded over said second metal layer (For Example: See Figure 2F).

In regards to claim 80, Akram fails to disclose the following:

- a) a first metal layer comprises aluminum.

However, Yanagida discloses a first metal layer (20a) that comprises aluminum (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Akram to include aluminum as disclosed in Yanagida because it aids in increasing adhesion (For Example: See Column 3 Lines 17-19).

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Additionally, since Akram and Yanagida are both from the same field of endeavor, the purpose disclosed by Yanagida would have been recognized in the pertinent art of Akram.

5. Claims 75 and 86 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akram (U.S. Patent No. 6,544,880) in view of Yanagida (U.S. Patent No. 6,545,355) and Galloway (U.S. Patent No. 5,783,868).

In regards to claims 75 and 86, Akram fails to disclose the following:

a) second metal layer has a thickness of between about 2um and 20um.

However, Galloway discloses a semiconductor device that has a gold layer that has a thickness of between about 2um and 20um (For Example: See Column 3 Lines 41-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Akram to include a gold layer that has a thickness of between about 2um and 20um as disclosed in Galloway because it aids in avoiding damage to the contact area (For Example: See Column 1 Lines 33-67 and Column 2 Lines 1-10).

Additionally, since Akram and Galloway are both from the same field of endeavor, the purpose disclosed by Galloway would have been recognized in the pertinent art of Akram.

Finally, the applicant has not established the critical nature of a "second metal layer has a thickness of between about 2um and 20um." "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims: . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). Therefore, it would

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have been obvious to one having ordinary skill in the art at the time the invention was made to have various ranges:

6. Claims 76-78 and 87-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akram (U.S. Patent No. 6,544,880) in view of Yanagida (U.S. Patent No. 6,545,355) and Weng (U.S. Patent No. 6,720,243).

In regards to claims 76 and 87, Akram fails to disclose the following:

a) a third metal layer between said first and second layers, wherein said third metal layer comprises a titanium-tungsten alloy.

However, Weng discloses a semiconductor device that has a third metal layer (208) between said first (206) and second layers (210), wherein said third metal layer comprises a titanium-tungsten alloy (For Example: See Column 3 Lines 30-35). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Akram to include a third metal layer between said first and second layers, wherein said third metal layer comprises a titanium-tungsten alloy as disclosed in Weng because it aids in providing good bump quality (For Example: See Column 2 Lines 25-65).

Additionally, since Akram and Weng are both from the same field of endeavor, the purpose disclosed by Weng would have been recognized in the pertinent art of Akram.

In regards to claims 77 and 88, Akram fails to disclose the following:

a) a third metal layer between said first and second layers, wherein said third metal layer comprises chromium.

However, Weng discloses a semiconductor device that has a third metal layer (208) between said first (206) and second layers (210), wherein said third metal layer comprises chromium (For Example: See Column 3 Lines 30-35). It would have been obvious to one having

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ordinary skill in the art at the time the invention was made to modify the semiconductor of Akram to include a third metal layer between said first and second layers, wherein said third metal layer comprises chromium as disclosed in Weng because it aids in providing good bump quality (For Example: See Column 2 Lines 25-65).

Additionally, since Akram and Weng are both from the same field of endeavor, the purpose disclosed by Weng would have been recognized in the pertinent art of Akram.

In regards to claims 78 and 89, Akram fails to disclose the following:

a) a third metal layer between said first and second layers, wherein said third metal layer comprises titanium.

However, Weng discloses a semiconductor device that has a third metal layer (208) between said first (206) and second layers (210), wherein said third metal layer comprises titanium (For Example: See Column 3 Lines 30-35). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Akram to include a third metal layer between said first and second layers, wherein said third metal layer comprises titanium as disclosed in Weng because it aids in providing good bump quality (For Example: See Column 2 Lines 25-65).

Additionally, since Akram and Weng are both from the same field of endeavor, the purpose disclosed by Weng would have been recognized in the pertinent art of Akram.



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7. Claims 79 and 90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akram (U.S. Patent No. 6,544,880) in view of Yanagida (U.S. Patent No. 6,545,355) and Chikawa et al. (U.S. Patent No. 5,310,699).

In regards to claims 79 and 90, Akram fails to disclose the following:

a) a third metal layer between said first and second layers, wherein said third metal layer has a thickness of between 2700 and 3300 Angstroms.

However, Chikawa et al. ("Chikawa") discloses a semiconductor device that has a titanium-tungsten layer that has a thickness of between 2700 and 3300 Angstroms (For Example: See Column 4 Lines 22-25). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Akram to include a titanium-tungsten layer that has a thickness of between 2700 and 3300 Angstroms as disclosed in Chikawa because it aids in providing good adhesion (For Example: See Column 4 Lines 22-25).

Additionally, since Akram and Chikawa are both from the same field of endeavor, the purpose disclosed by Chikawa would have been recognized in the pertinent art of Akram.

Finally, the applicant has not established the critical nature of a "third metal layer has a thickness of between 2700 and 3300 Angstroms." "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have various ranges.

*Response to Arguments*

8. Applicant's arguments filed 5/16/07 have been fully considered but they are not persuasive. First, Applicant argued that "Akram fails to teach or suggest an aluminum layer over the copper metal layer base 12." However, Akram is not utilized to disclose an aluminum layer. Yanagida discloses the use of aluminum (20a) (For Example: See Figure 1). Additionally, Applicant is arguing a limitation that is not present in the claim "an aluminum layer over the **copper** metal layer."

Second, Applicant argues that the "there is no discussion of wire bonding in Yanagida...those skilled in the art would have no motivation to add another metal layer used to be wirebonded thereto over the adhesion layer 20a comprising aluminum." However, Yanagida is being utilized to disclose the use of aluminum. Akram is being utilized to disclose "a second metal layer over said first metal layer, wherein said second metal layer is used to be wire bonded" (For Example: See Figure 2F).

Third, Applicant argued that "the two cited references are non-analogous and the teachings of Yanagida are not pertinent to those of Akram...it is believed that the easily removed bond pad 12a is non-analogous to the bond pad 12'', 12' and/or 12''' of Akram's device. In response to applicant's argument, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Akram and Yanagida are both from the same field of endeavor, semiconductors.

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Fourth, Applicant argued that “Weng fails to teach, hint or suggest that a pad including multiple metal layers 106, 108 and 110 can be used to be wirebonded thereto, but teaches the pad is used to be solder bonded thereto, which is believed to be non-analogous to the pad 12”, 12’ and/or 12’’’ in Akram’s device used to be wirebonded thereto.” However, it not clear what Applicant is arguing in regards to multiple metal layers 106, 108 and 110. The Examiner does not see anything in the office action with those reference numbers. Additionally, Akram is utilized to disclose wire bonding not Weng. Weng is utilized to disclose a third metal layer (208) between said first (206) and second layers (210), wherein said third metal layer comprises titanium (For Example: See Column 3 Lines 30-35).”

Finally, Applicant argued that “Chikawa fails to teach, hint or suggest that a pad 6 can be used to be wirebonded thereto, but teaches the pad 6 is used to have a gold bump 7 thereon, which is believed to be non-analogous to the pad 12”, 12’ and/or 12’’’ in Akram’s device used to be wirebonded thereto.” However, Akram is utilized to disclose wire bonding not Chikawa. Chikawa is utilized to disclose a titanium-tungsten layer that has a thickness of between 2700 and 3300 Angstroms (For Example: See Column 4 Lines 22-25).

### ***Conclusion***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838. If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization

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where this application or proceeding is assigned is 571-273-8300 for regular and after final communications.

ML

August 8, 2007

A handwritten signature in black ink, appearing to be 'ML' with a stylized flourish.

**MONICA LEWIS**  
**PRIMARY PATENT EXAMINER**